CRITICAL PLANTS OF THE UPPER GREAT LAKES REGION OF ONTARIO AND MICHIGAN

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(*Continued from page 222*)

CRYPTOGRAMMA CRISPA AND C. ACROSTICHOIDES (PLATES 356 and 357).—Having occasion to check as closely as possible the range of the dimorphic fern which in America passes as *Cryptogramma acrostichoides* R. Br. I have become increasingly perplexed to find satisfactory characters to separate it as a species from the European *C. crispa* (L.) R. Br. and the Asiatic *C. Brunoniana* Wallich.

The difficulty is an old one. Robert Brown set up the genus *Cryptogramma*, basing it on the plant brought back by Richardson from the Nelson or the Mackenzie drainage-systems: "In shady rocky woods, between lat. 56° and 60° north. (First found by Mr. Menzies at Nootka Sound)"[1]; but he also included doubtfully with it in the genus the *Pteris crispa* (L.) All., the plant now called *C. crispa* (L.) R. Br. and confined to Europe and adjacent Asia, saying that the European plant differs in having the sori shorter and more rounded, the American with them linear: "Typus generis est Cryptogramma acrostichoides, sed character constructus pro receptione Pteridis crispae *auctor*. quae equidem species, ob soros abbreviatos potius subrotundos quam lineares, venulas terminantes sinum feré involcri occupantes et cito confluentes, tunc aemulantes sorum linearem continuum costae parallelum Pteridis, cum cujus speciebus pinnulis angustatis involucro omnino tectis, habitu bené satis convenit." Kaulfuss, in 1824, reduced *Cryptogtramma acrostichoides*, with doubt, to *Allosorus crispus* (L.) Bernh., basing his reduction on examination of Chamisso's material from Unalaska.

In 1829 Hooker republished Brown's account of *Cryptogramma acrostichoides*, citing first the Menzies collection from Nootka Sound, followed by that of Richardson from the Nelson or the Mackenzie area, and showing typical *C. acrostichoides* in one of Greville's beautiful plates,[2] here reproduced as our PLATE 356. Referring to Robert Brown's doubt as to the generic identity of the American and the European plants, Hooker said: "To us, however, there appears no generic difference; and the fertile fronds have the closest similarity, in almost every particular, except in the rather shorter *sori* of *capsules*.

[1] R. Br. in Richardson, Frankl. Journ. App. ed. 1: 754, repr. 26, and 767, repr. 39 (1823).

[2] Hook. & Grev. Ic. Fil. i. t. xxix (1829).

In the sterile fronds the pinnules are much broader and never wedge-shaped, in the plant [*C. acrostichoides*] now before us."

Two years later, with a plate (t. clviii), here reproduced as our PLATE 357, Hooker took up a manuscript name of Wallich's for a plant of alpine summits of the Himalayas and published as a new species *Cryptogramma Brunoniana*.[1] The plate of it (our PLATE 357), except for the right-hand sterile frond, might have been drawn from the type-collection of *C. acrostichoides* (our PLATE 356). Note the very similar pinnules of the sterile frond on the left, of *C. Brunoniana*, and those of the Greville plate of *C. acrostichoides*, the essentially identical fertile fronds, the venation of the inrolled pinnules, the enlarged sori and the spores. Although Hooker, following Wallich, intended to compliment Robert Brown in the specific name, the dedication had mixed values:

> Amongst the extensive and valuable collection . . . made by Dr. Wallich . . . , few have given us more pleasure than a species of *Cryptogramma*,—the subject of the present plate,—which was detected on the lofty "Kumaun," a part of the great range of the Himala mountains, by Robert Blinkworth. . . . And this too, though from so very remote a country, is yet *almost* identical with that of Nootka Sound and Subarctic America. The only difference exists in the sterile fronds . . .
>
> Dr. Wallich accompanied the specimens with the remark, "Dedicavi speciem conditori generis immortali, amico aestimatissimo": and we think ourselves honoured in being permitted to give publicity to so interesting a plant, which bears the name of the greatest Botanist of this or any other age or country.

Hooker's dedication, recalling Humboldt's gracious tribute to Robert Brown as "botanicorum facile princeps" everyone could applaud; but, unfortunately, the specific value of *Cryptogramma Brunoniana* was soon doubted by Hooker himself. In his most scholarly work on the ferns, Species Filicum, Hooker in 1858, taking the unjustifiable liberty of changing Brown's *Cryptogramma* to *Cryptogramme*, went further. He boldly reduced both *C. acrostichoides* and *C. Brunoniana* to mere FORMS of the European *C. crispa*. His revocation of the Asiatic and the American species was clearly stated:

> In taking the bold step to unite several supposed species into one, as I have here done, contrary to the judgment of the most distinguished botanists, it is necessary that I offer explanation, especially when, in conjunction with my friend Dr. Greville (Icones Filicum), I published as distinct two of the species I propose to abolish, viz. the N. American *C. acrostichoides*, Br., and the Northern Indian *C. Brunoniana*, Wall. I would however call attention to the remark made, firstly, under *C. acro-*

[1] Wallich in Hook. & Grev. Ic. Fil. ii. t. clviii (1831).

stichoides: "Mr. Brown has drawn up the character of the genus so as to include our *Pteris crispa*, which he nevertheless considers a doubtful species of *Cryptogramme*. To us, however, there appears no generic difference; and the fertile fronds have the closest similarity in almost every particular except the shorter sori (in *C. crispa*). In the sterile fronds the pinnules are much broader, and never wedge-shaped in the plant before us (*C. acrostichoides*)." Under *C. Brunoniana* we observed, "This, though from so remote a country (Himalaya), is yet almost identical with that of Nootka Sound and subarctic America (*C. acrostichoides*); the only difference exists in the sterile fronds," &c. If indeed there was a manifest difference in the sori, so as to constitute different genera, between *C. crispa* and *C. acrostichoides* and *Brunoniana*, as Presl, and lately Mettenius, maintain is the case, the first could upon no account be united with the two latter; but I think I may appeal to the magnified representations of the sori of *C. crispa*, as given in our 'Genera Filicum' and in Fée's 'Genera Filicum,' and of those of the two kinds in the 'Icones Filicum,' in support of my views that there is no available distinction; and I have copious specimens before me at this moment of our British species (*C. crispa*), in proof that, as in *C. acrostichoides*, these sori occupy so much of the veins, and are "ita approximati, ut discus totus pinnulae explanatae capsulis maturis tectus est, et in hoc stadio filix species *Grammitidis* vel *Acrostichi* quasi evadit," *Br.* Our specimens, gathered in an advanced state in Galloway, Scotland, have the involucres quite spreading, and exposing the sori occupying nearly the whole veins.

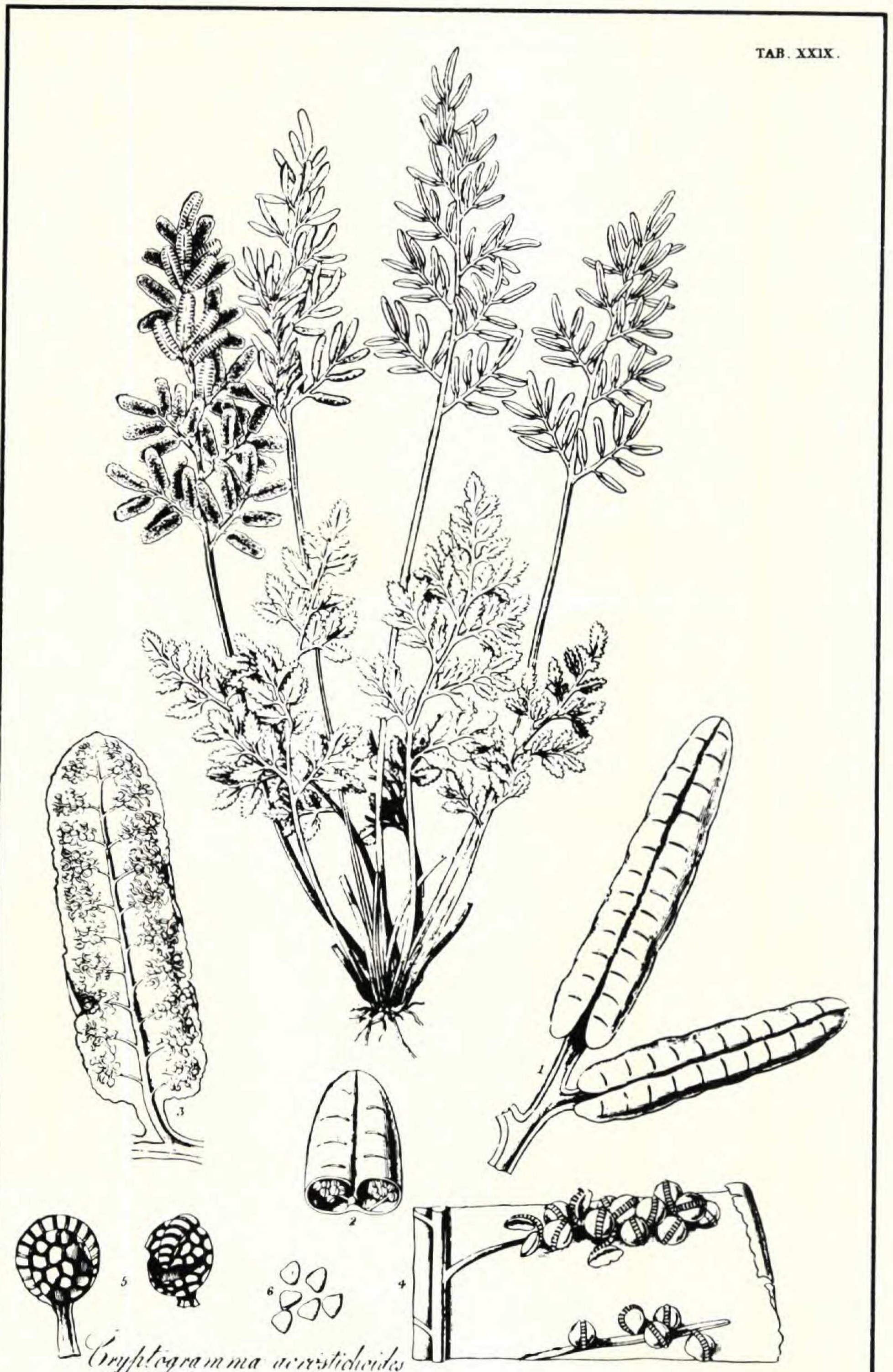
When an old plant is found in a very distant part of the world from its previously known locality, one is apt to look upon it as something new; and, as is the case with the Cedar of Lebanon and the Cedar of Himalaya, it is very difficult to remove the impression once made upon the mind, although no tangible character to distinguish them can be detected.

I shall now consider the different variations or forms of our plant, as much as possible under their respective countries, for I allow that the mass of specimens from Europe, Asia, and America, exhibit some slight differences, often not easily defined.[1]

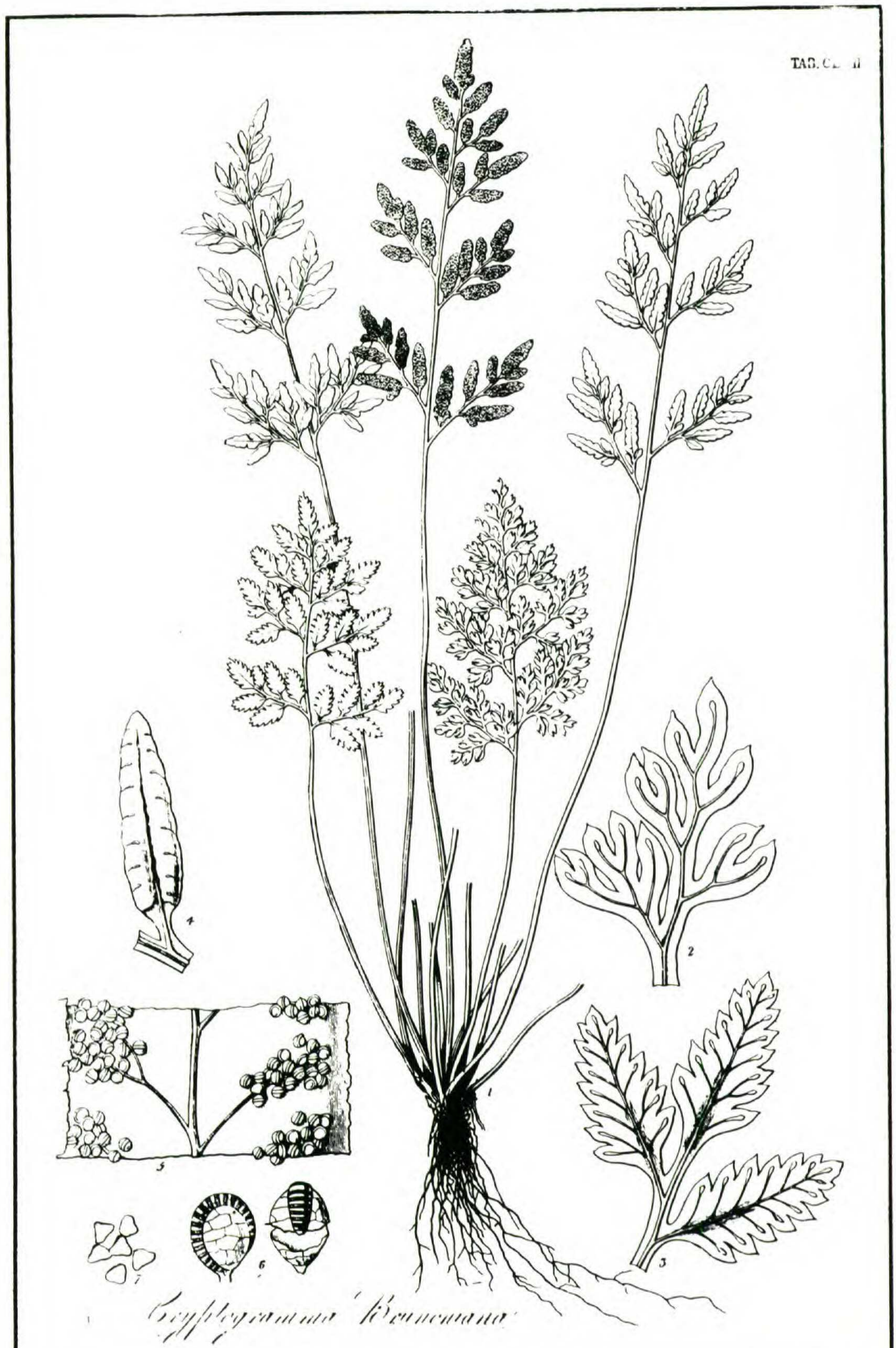
Under his *Cryptogramma crispa*, forma *europaea* he continued

Notwithstanding that our learned friend, Mr. Brown, framed his character of *Cryptogramme* with a view to include our *C. crispa*, "quae dubia quidem species, ob soros abbreviatos potius subrotundos quam lineares," we are disposed to consider it by no means generically distinct, and not even specifically so, either from that gentleman's *C. acrostichoides*, or from the *C. Brunoniana* of Dr. Wallich. It is true that the chief distinction between the plant now under consideration and the two latter is, that *C. crispa* has often the fertile pinnules when mature narrower, with smaller or shorter sori and fewer sporangia, but that is very variable in different specimens, and these sori do not extend and become so completely confluent over the back of the pinnules as generally to force back the involucres, and thus to present a broader surface of pinnule, as is more or less common to the other two kinds; but this is a character not unlikely to depend on soil and climate, and which, in other Ferns, would not be considered of specific, much less of generic value. Another peculiarity in this state of *C. crispa* is, that its habit is more slender than

[1] Hook. Sp. Fil. ii. (pt. v.) 127, 128 (1858).



CRYPTOGRAMMA CRISPA, var. ACROSTICHOIDES (*C. acrostichoides*, after Hooker & Greville).



Cryptogramma crispa, var. Brunoniana (*C. Brunoniana*, after Hooker & Greville).

the continental forms, though even this is by no means universal; some of our specimens are very stout and firm.

Under forma *indica* (*C. Brunoniana*) he made the further note

I place this variety next to the European form, because, in the aggregate of specimens before me, the sterile fronds are exactly as in our European plant, that is, of two kinds, the one kind with the obovate segments deeply divided, serrated, single-nerved, the other with the pinnules elliptical, deeply serrated and pinnatedly veined, whereas the fertile pinnules more resemble those of the following (American) form, although they are not quite so large; but, while the majority of the Indian specimens are as here described, there are others that are more slender and flaccid, with fronds and narrower fertile pinnules, in short, in all particulars resembling our own native specimens.

And in discussing the American plant, his *C. crispa*, forma *americana* (*C. acrostichoides*), Hooker, citing the material of Richardson, Menzies and Douglas, said "The specimens from these stations may be considered the types of the *C. acrostichoides*, Br., and were the first recognized specimens referred to *Cryptogramme;* and they all have the broad, flattened, mature, fertile pinnules, the generally elliptical, rigid, sterile ones." Continuing, he cited the collections from southern Alaska (of Ruprecht, Barclay, Chamisso and Mertens) and made the significant note: "all these, and specimens just received (March, 1857)[1] from J [I]. A. Lapham, Esq., gathered on Isle Royale, Lake Superior, by W. D. Whitney, Esq.,—the only locality known within the United States,—possess quite the European form."

Somewhat earlier, in 1845, Ruprecht,[2] reducing *Cryptogramma* to *Allosorus*, recognized four species in the series now under discussion: *A. crispus* (L.) Bernh. of Europe; *A. foveolatus* Rupr., a renaming, in part, of *Cryptogramma acrostichoides* R. Br., the species said to have the fruiting fronds "valde similis A. crispo," but the sterile coriaceous and opaque, less dissected and with the margins of the upper surfaces strongly foveolate; *A. sitchensis* Rupr. from Sitka, with fronds more divided than in *A. foveolatus* and the foveae not apparent; and *A. Brunonianus* (Wall.) Rupr., the Himalayan plant which he separated from the two American merely by the mucronate pinnules of the sterile fronds ("differt ab A. foveolato et A. sitchensi pinnulis sterilibus mucronatis"). In this connection it should be noted that the conspicuous foveae emphasized by Ruprecht for the commoner American series were specially shown in Greville's plate of the type of *Crypto-*

[1] This item, "March, 1857," is of special significance in view of the date printed on the title-page, "1851."

[2] Rupr. Distrib. Crypt. Vasc. Imp. Ross. in Beitr. Pflanzenk. Russ. Reich. iii. 46, 47 (1845).

gramma Brunoniana. Ledebour[1] accepted Ruprecht's treatment but separated the American plants from the European as a section on the character alleged by Brown, the reputed difference in position of the sori, a "distinction without a difference," as pointed out by Hooker and several later students.

In 1867, without further comment, Hooker & Baker treated[2] *Cryptogramma* as a monotypic species, *C. crispa* R. Br. with two varieties: "β, *C. Brunoniana*, Wall." and "γ, *C. acrostichoides*, R. Br." And other European and Asiatic students of the ferns have expressed similar views. Thus, in 1867, Milde, retaining these plants in *Allosorus*, treated them as one species: *A. crispus* (L.) Bernh., with var. *acrostichoides* (R. Br.) Milde[3] and var. *Brunonianus* (Wall.) Milde. Var. *acrostichoides* was separated along the already emphasized lines, with the addition of the darker median band of the scales ("A forma europaea haec forma differt lamina sterili subcoriacea et segmentis ultimatis ovalibus crenatis, paleis medio coloratis"). However, an Alaskan specimen showed uniformly colored scales and one from the arid subalpine region of Spain had the foliage of the American plant, while even in Silesia plants transitional between the European and American were found ("Formae quae transitum ab europaea ad americanam significant, etiam in Silesia inveni [with citation of illustrations]. Sed multo copiosiores sunt formae ad Brunonianam spectantes, . . . Specimina Kadjakiana [from Kadiak Island, Alaska] paleis fere semper concoloribus, rarissime striolatis gaudebant. In Hispania . . . cl. *Lange* in regione subalpina specimina pusilla Allosori crispa legit, quorum segmenta ultima omnino formam hujus varietatis 'acrostichoides' habent"). Finally, Milde pointed out that the most significant difference is the presence of the conspicuous foveolae on the upper surfaces of the sterile pinnules in vars. *acrostichoides* and *Brunoniana* ("Quam levis momenti foveolae illae in pagina superiore varietatis *acrostichoidis* sint, ex hoc intelligendum est, quod eae quoque in varietate *Brunoniana* saepissime observandae sunt").

In 1880 in his *Review of the Ferns of Northern India*, C. B. Clarke was definite. Reducing *C. acrostichoides* and *C. Brunoniana* to *C. crispa* he said: "I can see no difference between the Himalayan and European plants, nor can I distinguish any Himalayan variety. Milde says the Himalayan form has the barren fronds with the ultimate segments

[1] Ledeb. Fl. Ross. iv. 525 (1853).
[2] Hook. & Bak. Synop. Fil. 144 (1867).
[3] Milde. Fil. Eur. et Atl. 24–26 (1867).

more acutely serrate; but I suspect Milde's stock of Himalayan material on which he ventured this distinction was small. I have collected the plant more than twenty times between Dhurmsala and the Karakorum. None resemble the American var. *acrostichoides*."[1]

In 1881, James Britten made an inconclusive but rather strong argument[2] for uniting all three as one species; in 1884, Boissier definitely treated[3] them all as one. In 1897 Christ[4] made short shrift of the question, treating *Cryptogramma crispa* as a species without varieties, occurring in Europe, Asia and North America; but in 1910[5] he wrote of the Asiatic and the North American plants as "Subspezies: *C. Brunoniana* . . . und in einer dritten: *C. acrostichoides*." In 1907, Hegi, likewise, united[6] them all as one species with Himalayan and American varieties. The latest European estimate of the three comes from Christensen in 1927. Writing of the Kamtchatkan plant, he calls it the American *C. acrostichoides*, but with the pertinent note:

> The beautiful specimens agree closely with the species quoted above, which was previously not known from Asia. The differences between it and the European *C. crispa* are so small that I am inclined, like MILDE, to consider it a variety of *C. crispa*. Specimens collected, for instance, at Lofoten (Svolvaer), without doubt belonging to *C. crispa*, can scarcely be distinguished from *C. acrostichoides*. The best characters of this species show the basal scales, which are dark-brown in the centre (in *C. crispa* concolorous) and the small pits (faveolae — conf. the syn. *Allosurus faveolatus* RUPR.) on the upper side of the lamina above the tips of the veins; they are probably to be found only in dried specimens.[7]

In American treatments I find little or no reflection (except by George Lawson, whose viewpoint was essentially European) of the judgments of Hooker, Milde, Clarke and Christensen, that *Cryptogramma acrostichoides* is a geographic variety of *C. crispa*. With the works of Hooker and of Milde before him D. C. Eaton wrote, in 1880, of the American *C. acrostichoides* and the European *C. crispa:*

> The two plants are in fact so nearly allied that Hooker and Milde have considered the American only a variety of the European, and Hooker said that some of the Scottish specimens in his collection were almost identical with those from North America, and that he had some from the United States and from British Columbia quite agreeing with the common European form. While it is indisputable that there may be specimens from one continent much resembling the type usually seen in the other,

[1] C. B. Clarke, Trans. Linn. Soc. ser. 2, Bot. i. 459, 460 (1880).
[2] Britten, Europ. Ferns, 57–63 (1881).
[3] Boissier, Fl. Orient. v. 726 (1884).
[4] Christ, Farnkr. der Erde, 157 (1897).
[5] Christ, Geogr. der Farne, 123 (1910).
[6] Hegi, Ill. Fl. Mitteleur, i. 36 (1907).
[7] Christensen in Hultén, Fl. Kamtch. and Adj. Isl. i. 43 (1927), where Christensen unjustifiably altered the spelling of *Allosorus foveolatus* to *A. faveolatus*.

yet the normal type of *C. acrostichoides* is so different from that of *C. crispa*, that, for the present purpose certainly, it is better to keep them apart.[1]

Eaton's treatment of the admittedly confluent plants of the two continents as two species, in spite of the inconstancy of the characters, has, apparently, been quite satisfactory to all American botanists. I can find no American treatment (except Lawson's in 1889) of it as a variety of *Cryptogramma crispa*. This is perhaps due to lack of sufficient Old World material for proper comparisons in many American herbaria or merely to the fact that attention has not been focussed on the question. We freely admit other circumboreal types, even though the American plants may often show well defined varietal differences: *Botrychium Lunaria, Cystopteris fragilis, Thelypteris Phegopteris* and *T. fragrans, Polystichum Lonchitis* and *P. Braunii, Athyrium Filix-femina* and *alpestre, Asplenium viride* and *septentrionale, Phyllitis Scolopendrium, Lycopodium annotinum, Selaginella selaginoides* and many others. Why, in view of the evidence, discriminate against *Cryptogramma crispa?*

The preceding summary of the conclusions of Hooker, Milde, Clarke, Christensen and others regarding the breaking down of specific lines between *Cryptogramma crispa*, at one end of the series, and *C. acrostichoides* at the other, was prepared after a personal study of the material had convinced me of the specific identity. In my own study of the material I had detected and correlated the characters which, to my great satisfaction, I find that others before me and with a tremendous advantage of experience and fuller material have already pointed out. The disrupted range (MAP 12) of the aggregate species, *C. crispa*, is such as to indicate that its geographic segregation was an early one. The three geographic varieties are indicated in the following synopsis.

Sterile fronds submembranaceous to subcoriaceous, when dry translucent to transmitted light, clearly displaying the nerves; nerve-tips not conspicuously foveolate; pinnules chiefly cuneate at base and deeply cleft: fertile fronds quadripinnate to bipinnate, with 35–200+ pinnules 0.2–1 cm. long: basal scales mostly concolorous, pale to full brown . . . . . *C. crispa*, var. *typica.*

Sterile fronds chartaceous to coriaceous, opaque; nerve-tips (at least in dried specimens) conspicuously foveolate: fertile fronds bipinnate or tripinnate, with 25–115 pinnules 0.2–2 cm. long: basal scales mostly with median castaneous center, or concolorous.

Some or all of the sterile fronds with cuneate-obovate or subflabelliform deeply cleft pinnules: fertile pinnules 25–85, 0.2–1.1 cm. long; basal scales mostly pale and concolorous. Var. *Brunoniana.*

[1] D. C. Eaton, Ferns of N. Am. ii. 102 (1880).

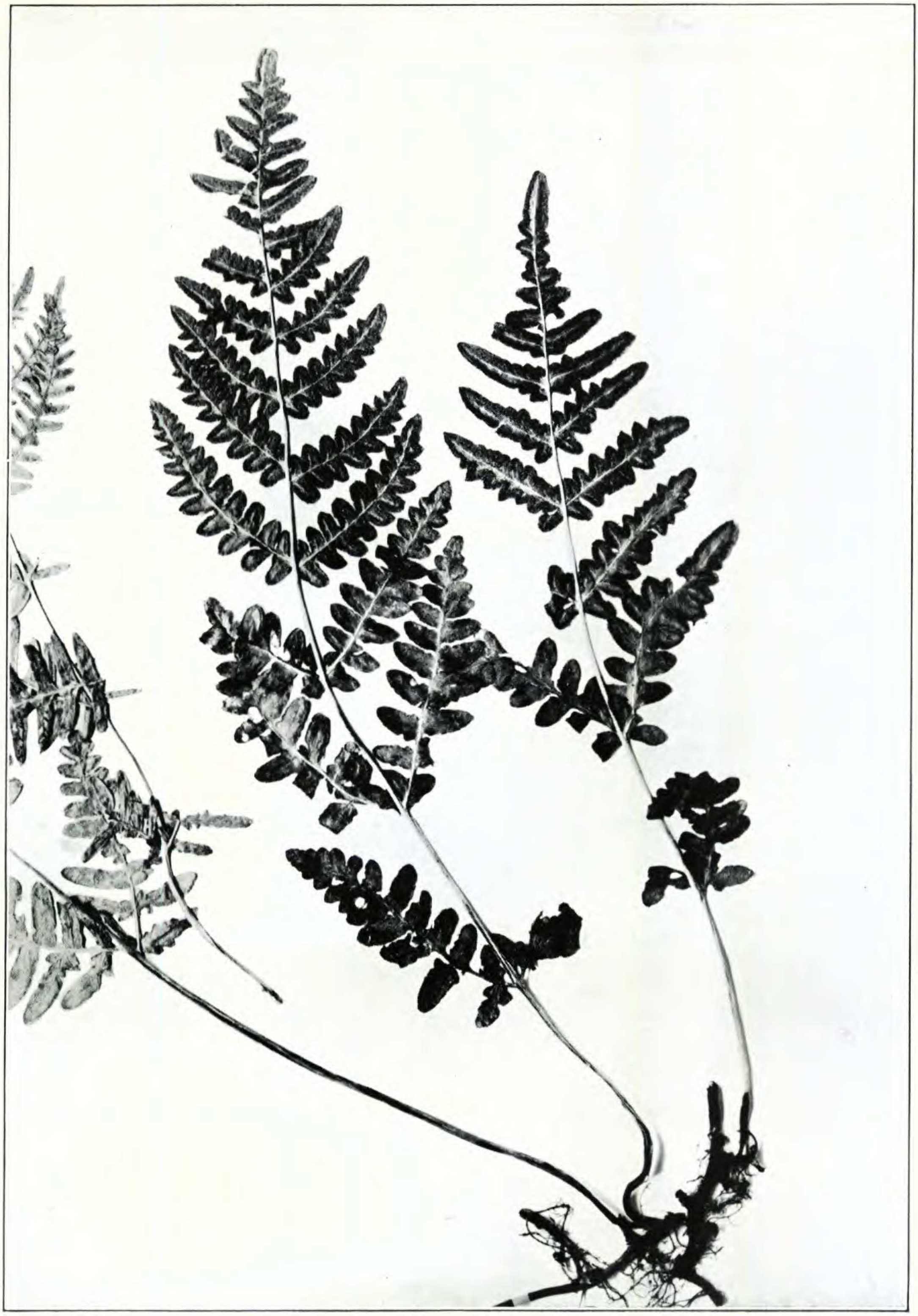


Photo. E. C. Ogden.

PTERIDIUM AQUILINUM, var. LANUGINOSUM, forma DECIPIENS, × ⅗, from Quebec.

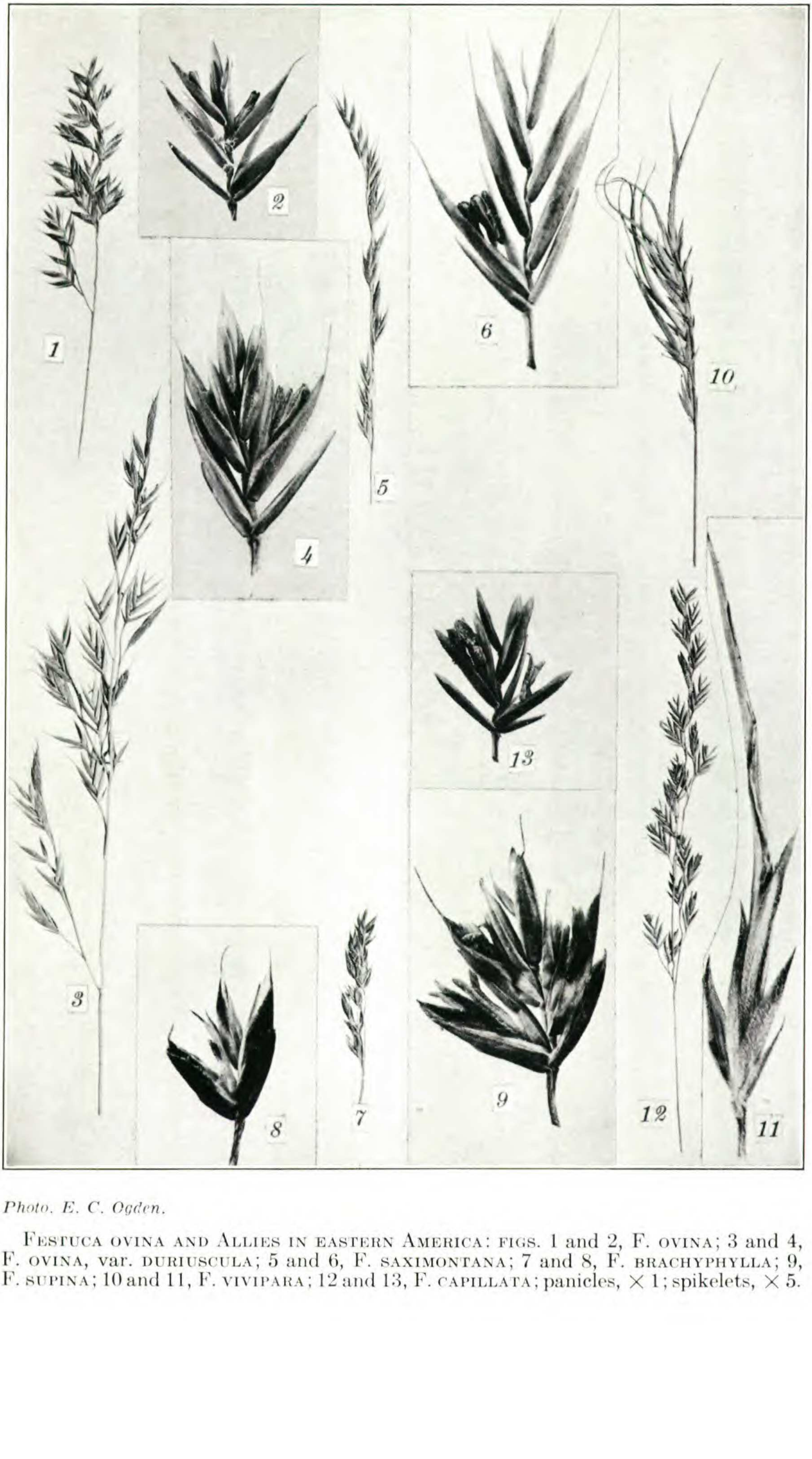
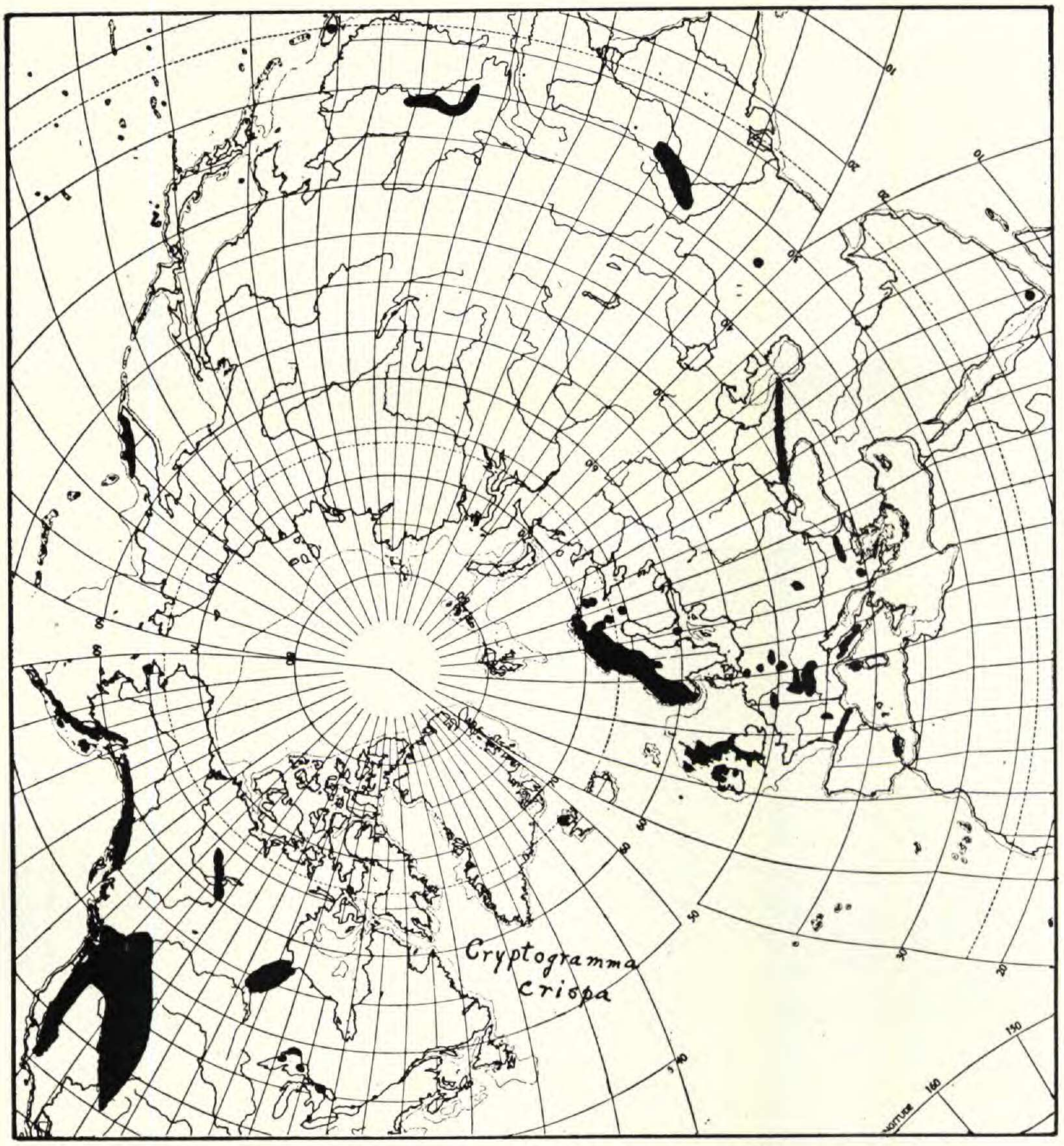


Photo. E. C. Ogden.

FESTUCA OVINA AND ALLIES IN EASTERN AMERICA: FIGS. 1 and 2, F. OVINA; 3 and 4, F. OVINA, var. DURIUSCULA; 5 and 6, F. SAXIMONTANA; 7 and 8, F. BRACHYPHYLLA; 9, F. SUPINA; 10 and 11, F. VIVIPARA; 12 and 13, F. CAPILLATA; panicles, × 1; spikelets, × 5.

All the sterile fronds with oblong or narrowly ellipitic crenate to incised pinnules: fertile pinnules 25–115, mostly 0.4–2 cm. long: basal scales mostly with casteneous centers. . . . . Var. *acrostichoides*.

C. CRISPA (L.) R. Br., var. **typica.** *Osmunda crispa* L. Sp. Pl. ii. 1067 (1753). *Pteris crispa* (L.) All. Fl. Pedem. ii. 284 (1785). *Acrostichum crispum* (L.) Vill. Hist. Pl. Dauph. iii. 838 (1789). *Polypodium crispum* (L.) Roth, Usteri Neu. Ann. ii. 10 Stück. 56 (1794).



MAP 12. World-Range of CRYPTOGRAMMA CRISPA.

Onoclea crispa (L.) Hoffm. Deutschl. Fl. ii. 11 (1795). *Allosorus crispus* (L.) Bernh. in Schrad. Neu. Journ. 1^2. 36 (1806). *Blechnum crispum* (L.) Hartm. Handb. Skand. Fl. 372 (1820). *Stegania onocleoides* S. F. Gray, Nat. Arr. Brit. Pl. ii. 16 (1821). *Phorolobus crispus* (L.) Desv. Prodr. 291 (1827). *Struthiopteris crispa* (L.) Wallr. Fl. Cr. Germ. i. 27 (1831). *C. crispa* (L.) R. Br. in Richardson, Frankl. Journ. App. ed. 1: 767, rep. 39 (1823) by implication but without

transfer; Hook. & Bauer, Gen. Fil. t. cxv B (1842), where ascribed to Brown.—Europe and adjacent Asia.

Var. **Brunoniana** (Wallich), comb. nov. *C. Brunoniana* Wallich in Hook. & Grev. Icon. Fil. ii. t. clviii (1831); Beddome, Ferns Brit. Ind. t. clxiv (1868). *Gymnogramma Brunoniana* (Wall.) Presl, Tent. 219 (1836). *Allosorus Brunonianus* (Wall.) J. Smith, Journ. Bot. iv. 49 (1841). *Phorolobus Brunonianus* (Wall.) Fée, Gen. 131 (1850–52). *C. crispa,* forma *indica* Hook. Sp. Fil. ii. 129 (1858). *C. crispa,* β, *C. Brunoniana* (Wall.) Hook. & Baker, Syn. Fil. 144 (1867). *Allosorus crispus,* var. *Brunonianus* (Wall.) Milde, Fil. Eur. et Atl. 25 (1867). *C. crispa,* subsp. *C. Brunoniana* (Wall.) Christ, Geogr. der Farne, 123 (1910).—Alpine regions of the Himalayas; mountains of southern China; ? Japan. A few specimens, not wholly characteristic and with the castaneous scales and other characters transitional to the next, in southern Alaska, are referred as transitional to the next. They may include Ruprecht's proposed species. PLATE 357.

Var. ACROSTICHOIDES (R. Br.) C. B. Clarke, Trans. Linn. Soc. ser. 2, i. 460 (1880); Lawson, Fern Fl. Can. 236 (1889). *C. acrostichoides* R. Br. in Richardson, Frankl. Journ. App. ed. 1: 754, repr. 26, 767, repr. 39 (1823); Hook. & Grev. Ic. Fil. t. xxix. (1831); D. C. Eaton, Ferns N. Am. ii. 99, t. lix. figs. 1–5 (1880); Christensen in Hultén, Fl. Kamtch. and Adj. Isl. i. 43 (1927). *Allosorus foveolatus* Rupr. Distr. Crypt. Vasc. Imp. Ross. in Beitr. Pflanzenk. Russ. Reich. iii. 46 (1845). *A. sitchensis* Rupr. l. c. 47 (1845). *C. crispa,* forma *americana* Hook. Sp. Fil. ii. 130 (1858). *C. crispa,* γ, *C. acrostichoides* (R. Br.) Hook. & Baker, Syn. Fil. 144 (1867). *A. crispus,* var. *acrostichoides* (R. Br.) Milde, Fil. Eur. et Atl. 24 (1867). *C. acrostichoides,* forma *foveolata* (Rupr.) Gilbert, List N. Am. Pterid. 16 and *C. acrostichoides foveolata* (Rupr.) Gilbert, l. c. 36 (1901), the latter repeatedly spoken of as "a variety," and "this variety," although on the earlier page it was called a forma! *C. crispa,* subsp. *C. acrostichoides* (R. Br.) Christ, Geogr. der Farne, 123 (1910).—Kewatin to Alaska and Kamtchatka, south, locally, to islands of Lake Huron, Ontario, of Lake Superior, Ontario and Michigan, and along the mountains to New Mexico and southern California. PLATE 356.

In its very thick and opaque fronds, as compared with the submembranaceous and translucent fronds of the European *Cryptogramma crispa,* our var. *acrostichoides* shows the result of long-continued growth in the drier region of North America as contrasted with the generally more humid western Eurasia. Var. *acrostichoides* is stated to grow in Labrador (Britton & Brown); and Macoun (Cat. Can. Pl.) seems to quote Hooker as assigning it to "Rocks along the Arctic coast from Mackenzie River to Baffin Bay." I have not seen it from Labrador nor from within the Arctic Circle, nor can I trace Macoun's statement ascribed to Hooker. Ostenfeld did not know of it in Flora Arctica; neither did Simmons in his extensive studies of the Arctic

American flora. European authors have designated some other and later Old World varieties, which I have not been able to study; also one from Chile, which is open to serious doubt.

PTERIDIUM AQUILINUM (L.) Kuhn. var. **lanuginosum** (Bong.), comb. nov. *Pteris aquilina*, var. *lanuginosa* Bong. Mém. Acad. St. Pétersb. sér. 4, ii. 176 (1832). *Pteridium aquilinum*, var. *pubescens* Underw. Our Native Ferns, ed. 6: 91 (1900). *Pteris aquilina pubescens* (Underw.) Clute, Fern. Bull. xv. 124 (1907). *Filix-foemina aquilina* (L.) Farwell, var. *lanuginosa* (Bong.) Farwell, Am. Midl. Nat. xii. 290 (1931).

When Underwood published *Pteridium aquilinum*, var. *pubescens* in 1900 he was working under one of the so-called American rules which rejected a name if it repeated one ever used under the genus in any category. Consequently, since there had been a *Pteris lanuginosa* Bory (1810), Underwood rejected Bongard's varietal name (1832). Under the International Rules the latter must be retained.

Pteridium aquilinum, var. *lanuginosum* is the common bracken of western North America, from Alaska to California, Arizona, New Mexico and the high mountains of western Texas, south along the mountains to Guatemala, with an eastward extension into the Black Hills of South Dakota. East of the Black Hills it is highly localized: on the Gaspé Peninsula, where the cordilleran relationship is well known, the Gaspé plant being the basis of Lawson's *Pteris aquilina*, γ. *decipiens;* on the serpentine slopes and high crests near Black Lake, Megantic Co., Quebec (*Fernald & Jackson*, nos. 11,690 and 11,691), a region famous, also, for its remarkably localized relic-colonies of cordilleran plants (*Adiantum pedatum*, var. *aleuticum* Rupr., *Pellaea densa* (Brack.) Hook., *Festuca scabrella* Torr., etc.); and at Tobermory, at the tip of the Bruce Peninsula, another area famous for its isolated colonies of apparently relic species. Its other area eastward is in northern Michigan. The following Michigan specimens are in the Gray Herbarium: shore of Lake Superior, *C. T. Jackson;* Mackinac Island, *C. F. Wheeler*, no. 85; openings and thickets back of West Bluff, Keweenaw Co., *Fernald & Pease*, no. 3033. In the Gray Herbarium there are specimens reputed to come from New Jersey and Pennsylvania; their data, entered second-hand, is open to grave doubt. See p. 205

The plant described by Lawson from Gaspé as *Pteris aquilina*, γ *decipiens* is a remarkable form. Conventially, *Pteridium aquilinum* is characterized by its conspicuously deltoid frond. Lawson's account of his remarkable plant follows.

Pteris aquilina, Linn. . . . γ. *decipiens*.—Frond bipinnate, thin and membranous, lanuginose, pinnules pinnatifidly toothed, or, in small forms, entire, barren; L'Anse à Cabièlle, Gaspé, John Bell, B. A. This is a very remarkable fern, resembling a Lastrea, and in the absence of fructification, it is doubtfully referred to *Pteris aquilina*, yet the venation seems to indicate that it belongs to that species. . . . Being at a loss what to make of this fern, I sent it to Mr. D. C. Eaton, M. A., who is justly looked up to by American botanists as our best authority on American ferns, and he likewise failed to recognize it. I hope some visitor to Gaspé will endeavuor to obtain it in a fertile state, and thus relieve the doubt.*

* Since the above was written, I have had an opportunity of studying the forms and development of *Pteris aquilina*, and am quite satisfied that the doubtful plant is a state of that species, not old enough to be fertile.

Although Lawson's hope that some one would secure fertile plants from Gaspé of his *Pteris aquilina*, γ. *decipiens* was not fulfilled before his death, material (PLATE 358) which, unquestionably, belongs with it was collected by my former student, Dr. H. B. Jackson, and myself near the crest of Caribou Hill in Megantic Co., Quebec. There, as already noted, it is associated with a remarkable assemblage of relic-colonies of cordilleran plants. It is, therefore, significant that the Caribou Hill plant should have the ciliate indusium and the pubescence which characterize the cordilleran *Pteridium aquilinum*, var. *lanuginosum*. Another number from Caribou Hill is less unlike typical var. *lanuginosum*. It is, therefore, better to treat the plant with bipinnate fronds "resembling a Lastrea" as a form rather than as a true geographic variety. Mr. Ogden has photographed two of the fronds, × 3/5, of the fertile material from Caribou Hill (PLATE 358). Their superficial resemblance to *Thelypteris* (*Lastrea*) *marginalis* (L.) Neiuwl. is apparent. This form should be called

PTERIDIUM AQUILINUM, VAR. LANUGINOSUM, forma **decipiens** (Lawson), comb. nov. *Pteris aquilina*, γ. *decipiens* Lawson. Edinb. New Phil. Journ. n. s. xix. 110 (1864).—reprinted as Syn. Canad. Ferns and Filic. Pl. 11 (1864). Known only locally in Quebec. PLATE 358.

LYCOPODIUM SELAGO L., VAR. PATENS (Beauv.) Desv. MICHIGAN: glades and openings in thicket bordering calcareous beach of Lake Michigan, east of Manistique, Schoolcraft Co., no. 3060.

The only Michigan station for *L. Selago* cited by Dodge, is Farwell's in Keweenaw Co. Robbins got typical *L. Selago* in 1863 at Dana Mine, ?Keweenaw Co. (Gray Herb.) and Cooper got it on Isle Royale.

SELAGINELLA SELAGINOIDES (L.) Link. Cited for Michigan by Dodge only from Isle Royale and from Keweenaw Co., Upper Peninsula; reported by Gates & Ehlers from Emmet Co. The following additional stations are represented in the Gray Herbarium from MICHIGAN: Marquette Island, Mackinac Co., August 27, 1913, *W. H.*

Manning; Mackinac, August, 1885, *T. E. Boyce;* shore of Thunder Bay Island, Alpena Co., July 18, 1885, *C. F. Wheeler;* glades and openings in thicket bordering calcareous beach of Lake Michigan, east of Manistique, Schoolcraft Co., no. 3061.

POTAMOGETON OAKESIANUS Robbins. MICHIGAN: with *Eleocharis Robbinsii* Oakes, *Utricularia geminiscapa* Benj., *Eriocaulon septangulare* With. and *Drosera intermedia* Hayne in pools in a bog near Rock River, Alger Co., no. 3066.

Reported by Oosting (Pap. Mich. Acad. xv. 159) from a number of counties in the Lower Peninsula and Gogebic in the Upper Peninsula.

PANICUM DEPAUPERATUM Muhl., var. PSILOPHYLLUM Fern. When I described this glabrous-sheathed variety, RHODORA, xxiii. 193 (1921), I had not seen it from Michigan. The following collections establish its presence on the Upper Peninsula: sandy barrens west of Norway, Dickinson Co., no. 3068; sandy open pine barrens north of Gladstone, Delta Co., no. 3072.

PANICUM LINEARIFOLIUM Scribn. The broad range, "Maine to Kansas, south to Georgia and Texas" given by Hitchcock & Chase, excludes the region north of Lake Huron. Our collection from dry gneiss hills, Awrey, Sudbury District, ONTARIO, no. 3069, is from north of the Lake.

P. LINEARIFOLIUM, var. WERNERI (Scribn.) Fern. (*P. Werneri* Scribn.) The range given by Hitchcock & Chase is extended slightly northward. ONTARIO: dry gneiss hills east of Wasapitei, no. 3070. MICHIGAN: dry, open pine woods, Bête Grise, Keweenaw Co., no. 3071.

P. LANUGINOSUM Ell., var. LINDHEIMERI (Nash.) Fern. (*P. Lindheimeri* Nash). The northernmost stations cited by Hitchcock & Chase for Ontario and Michigan give no indication that the plant extends into the northern half of the Lake Huron region. The following collections represent this area. ONTARIO: calcareous gravel by pools, Cloche Peninsula, Manitoulin District, no. 3077; sandy shore of Lake Huron, Algoma, Algoma Distr., no. 3076. MICHIGAN: sandy and stony beach of Lake Huron, south of Alpena, no. 3082.

P. COLUMBIANUM Scribn. (Including *P. tsugetorum* Nash). The broad range given by Hitchcock & Chase (for *P. tsugetorum*), "Maine to Illinois," etc., excludes northern Ontario and the Upper Peninsula of Michigan. The following collections show its occurrence there. ONTARIO: dry gneiss hills east of Wasapitei, Sudbury Distr., no. 3073, and dry sandy plains and barrens, Espanola, Sudbury District, nos. 3074, 3075. MICHIGAN: sandy, open pine barrens north of Gladstone, Delta Co., no. 3080.

ORYZOPSIS CANADENSIS (Poir.) Torr. (*Stipa canadensis* Poir.). ONTARIO: dry sandy plains and barrens, Espanola, Sudbury Distr., no. 3090. MICHIGAN: dry spruce and pine barren near Humboldt, Marquette Co., no. 3089.

Previously known from east of Georgian Bay and from the north shore of Lake Superior, Ontario.

STIPA SPARTEA Trin. ONTARIO: sandy shore of Lake Huron, Algoma, Algoma Distr., no. 3092.

Previously known on the southern and eastern shores of Lake Huron as far as the tip of Bruce Peninsula: Tobemory, *Krotkov*, no. 7135.

MELICA SMITHII (Porter) Vasey. The measurements given by Hitchcock in Gray, Man. ed. 7, should be extended, in view of our new collections from northern Michigan: culms up to 1.5 m. high; blades to 1.5 cm. broad; panicle to 4.3 dm. long; spikelets to 2.4 cm. long (and down to only 1 cm. long). See p. 218 and MAP 11.

POA SYLVESTRIS Gray. MICHIGAN: woods south of L'Anse, Baraga Co., no. 3111.

Near, if not its northern limit in the state.

THE ALLIES OF FESTUCA OVINA IN EASTERN AMERICA (PLATE 359). —The members of the *ovina* series in eastern North America (separated from the *rubra* series by having the lower sheaths mostly whitish or drab, chartaceous, persistent, not soon disintegrating into fibers; new basal offshoots strongly ascending, from within the sheaths; anthers ¼–½ as long as the palea) are distinguished by the following characters.

a. Lemmas coriaceous to membranaceous, with awns at most 3 mm. long (or wanting); ovaries glabrous; panicles strict, rarely 1 dm. long . . . . *b.*
  b. Awns 1. 3–3 mm. long . . . . *c.*
    c. Panicle loosely open, with divergent short branches during anthesis, oblong to ellipsoid; lemmas coriaceous, strongly involute; anthers 2.5–3 mm. long.
      Culms 1.5–3 (–6) dm. high; leaves 0.4–0.6 mm. in diameter, 5–7-nerved; panicles 2–5 cm. long; spikelets 5–7 mm. long, 3–6-flowered; 2d glume 2.5–4 mm. long; lowest lemma 3–5 mm. long . . . . . *F. ovina.*
      Culms up to 7 dm. high; leaves 0.7–1.2 mm. broad, 7–9-nerved; panicles 4–10 cm. long; spikelets 7–10 mm. long, 4–9-flowered; 2d glume 3.5–5 mm. long; lowest lemma 4.5–6 mm. long . . . . . *F. ovina*, var. *duriuscula.*
    c. Panicle spiciform and close or loosely linear-cylindric to loosely lanceolate; anthers less than 2 mm. long.
      Panicle linear-cylindric or loosely lanceolate, 2–10 cm. long; lemmas greenish, coriaceous, strongly involute; anthers 1.2–1.7 mm. long . . . . . *F. saximontana.*
      Panicle dense, closely spiciform at least above, cylindric to lance-ovoid, usually 1–3 cm. long; lemmas purplish or bronze, membranaceous, tardily, if at all, involute; anthers 0.5–1 mm. long . . . . . *F. brachyphylla.*
  b. Awnless or with awns at most 0.6 mm. long.
    Florets modified into leafy proliferous shoots; 2d glume 3–5 mm. long; lemmas membranaceous, not strongly inrolled, 4–6 mm. long; stamens wanting . . . . . *F. vivipara.*

Florets normal, perfect; 2d glume 2–2.7 mm. long; lemmas coriaceous, tightly inrolled, 3–3.5 mm. long; anthers 1.5–2 mm. long ..... *F. capillata.*

a. Lemmas membranaceous, 5–6.5 mm. long, with awns 2.5–7 mm. long; ovary pubescent at summit; panicle lax, flexuous, mostly 1–2.5 dm. long. ..... *F. occidentalis.*

F. OVINA L. Sp. Pl. i. 73 (1753).—Eurasian; introduced in North America, and naturalized in dry soils, from Quebec to western New York and New Jersey. FIGS. 1 and 2.

Forma HISPIDULA (Hack.) Holmb., Scand. Fl. hft. ii. 234 (1926) (*F. ovina*, var. *vulgaris*, subvar. *hispidula* Hack. Mon. Fest. Eur. 87 (1882)) has hispid lemmas.

Var. DURIUSCULA (L.) Koch, Syn. 812 (1857). *F. duriuscula* L. Sp. Pl. 74 (1753).—More frequent, Newfoundland to Minnesota and Pennsylvania. FIGS. 3 and 4.

F. SAXIMONTANA Rydb. Bull. Torr. Bot. Cl. xxxvi. 536 (1909). *F. ovina*, var. *pseudovina* Beal, Grasses, N. Am. ii. 595 (1896), not *F. pseudovina* Hack. (1880). *F. pseudovina* Rydb. Mem. N. Y. Bot. Gard. i. 56 (1900), not Hack. (1880).—Dry crests, hills and sands, western Newfoundland; eastern Quebec; Smugglers Notch, Vermont; shores of Lake Huron, Ontario to British Columbia, south to Michigan, Wisconsin, Minnesota, Nebraska, Colorado and Utah. FIGS 5 and 6.

F. BRACHYPHYLLA Schultes, Man. iii. 646 (1827). *F. brevifolia* R. Br. App. Parry's Voy. Suppl. 289 (1824), not Muhl. (1817). *F. ovina*, var. *brevifolia* (R. Br.) Hack. Bot. Centralb. viii. 406 (1881). *F. ovina brachyphylla* (Schultes) Piper, Contr. U. S. Nat. Herb. x. 27 (1906). *F. supina* Am. Auth., not Schur (1866). *F. ovina supina* Piper, l. c. (1906), in part, not (Schur) Hack. (1881).—Greenland and arctic America, south to bleaker areas of Labrador, northern and western coast and mountains of Newfoundland, Anticosti Island and Shickshock Mts., Quebec, Keweenaw Co., Michigan, and alpine regions to Colorado, Utah, Nevada and California. FIGS. 7 and 8.

Although the arctic-alpine American plant is often passing as the central European *Festuca supina* Schur, it is very different, as worked out in the Gray Herbarium by my former student, now Dr. Ernst Abbe, when identifying his Labrador material. *F. supina* (FIG. 9) has anthers 2–3 mm. long, while the arctic-alpine American plant has them minute (0.5–0.8, rarely –1 mm. long). FIG. 9 is from *Petrak*, Fl. Bohemiae et Moraviae Exsicc. Lfg. VIII. no. 717, from near the type locality of *F. supina.*

F. VIVIPARA (L.) Sm. Fl. Brit. i. 114 (1800); Fernald, RHODORA, xxviii. 151 (1926). *F. ovina*, β, *vivipara* L. Sp. Pl. ed. 2, i. 108 (1762).—Arctic regions, south to mts. of Europe; in America from Greenland and Labrador to northern and western Newfoundland, Anticosti Island and Shickshock Mts., Quebec. FIGS. 10 and 11.

F. CAPILLATA Lam. Fl. Fr. iii. 597 (1778). *F. tenuifolia* Sibth. Fl.

Oxon. 44 (1794). *F. ovina*, var. *capillata* (Lam.) Hack. Bot. Centralb. viii. 405 (1881).—European; indigenous on dry open soil in southern Newfoundland, apparently also in Nova Scotia; introduced and naturalized westward to Michigan and south to Pennsylvania. FIGS. 12 and 13.

F. OCCIDENTALIS Hook. Fl. Bor. Am. ii. 249 (1840); Piper, Contrib. U. S. Nat. Herb. x. 24, pl. viii. (1906). *F. ovina*, var. *polyphylla* Beal, Grasses N. Am. ii. 597 (1896).—British Columbia to California, eastward to western Montana and northwestern Wyoming; woodlands of northern Michigan and adjacent Ontario eastward to Manatoulin Island and Bruce Peninsula.

Piper's diagnostic plate is so good that it is not necessary to illustrate this species.

AGROPYRON TRACHYCAULUM (Link) Malte. ONTARIO: limestone pavement and gravel, Great Cloche Island, no. 3141.

When I published on this group (RHODORA, XXXV. 170) the typical form of the species was unknown to me from between Lake Superior and the lower St. Lawrence. Its occurrence on the recently exposed beach of Great Cloche Island suggests that it may be more widely spread about Lake Huron.

SCIRPUS CLINTONII Gray. MICHIGAN: dry sandy plains near Driggs, Schoolcraft Co., no. 3153.

The only stations recorded by Beal are on the Lower Peninsula.

RYNCHOSPORA CAPILLACEA Torr., forma **leviseta** (E. J. Hill), comb. nov. *R. capillacea*, var. *leviseta* E. J. Hill ex Gray, Am. Nat. x. 370 (1876). *Phaeocephalum capillaceum* (Torr.) Farwell, var. *levisetum* (E. J. Hill) Farwell, Report Mich. Acad. Sci. xxi. 361 (1920).

The form with smooth instead of retrorsely barbellate bristles is interesting and worthy a designation, but it has no distinctive range, colonies of it occurring here and there through the broad range of the less localized typical *Rynchospora capillacea*. It is better considered a forma rather than a geographic variety. When it was first published, as noteworthy for its "*perfectly smooth*" bristles, it was clearly stated that "Except in this remarkable particular the plant appears to be undistinguishable from *R. capillacea*." Many subsequent collections strengthen this assertion.

CAREX PRAEGRACILIS W. Boott. (*C. marcida* Boott, 1839, not J. F. Gmel., 1791). MICHIGAN: forming dense carpets in damp sand, Eagle Harbor, Keweenaw Co., no. 3158.

A species of western North America (also South America) primarily of the cordilleran and Great Plains regions, from Yukon to central Mexico, heretofore known as an indigenous plant eastward to Mani-

Photo. E. C. Ogden.

CAREX GARBERI: FIG. 1, small plant, × 1; FIG. 2, orifice of sheath, × 5; FIG. 3, spike, × 5; FIG. 4, staminate scales, × 5; FIG. 5, denuded rachis, × 10; FIG. 6, perigynium, × 10.

C. GARBERI, var. BIFARIA: FIG. 11, portion of plant, × 1; FIG. 12, perigynium, × 10.

C. HASSEI: FIG. 7, spike, × 5; FIG. 8, staminate scales, × 5; FIG. 9, orifice of sheath, × 5.

C. AUREA: FIG. 10, portion of spike, × 5.

Photo. E. C. Ogden.

ZIGADENUS GLAUCUS: FIG. 1, flowering plant, × ⅖; FIG. 2, portion of inflorescence, showing firm bracts, × 2; FIG. 3, capsule, × 2.

Z. ELEGANS: FIG. 4, flowering plant, × ⅖; FIG. 5, portion of inflorescence, showing scarious bracts, × 2; FIG. 6, capsule, × 2.

toba, Minnesota and Iowa (Mackenzie, N. Am. Fl.). The Eagle Harbor colony is certainly indigenous, in damp depressions in the typical barrens of *Pinus Banksiana.*

C. HOOKERANA Dewey. ONTARIO: roadside, Schreiber, Thunder Bay District, *Pease & Bean,* no. 23,599.

Another species of the plains and prairies now extended eastward, from Manitoba and North Dakota, to the Lake Superior region. As noted in N. Am. Fl. the specific name was published by Dewey as *Hookerana* (not *Hookeriana* to which it has usually been altered). Dewey's material from Carlton House (TYPE in Gray Herb.) is distinctly called "*C. Hookerana* D."

C. EXILIS Dewey. MICHIGAN: very abundant (dominant) on a muskeag near Walsh, Schoolcraft Co., no. 3165.

The previously reported Michigan stations are in Keweenaw Co.

CAREX **Garberi,** n. sp. *C. aurea,* var. *androgyna* Olney in Bot. King Exp. 371 (1871), not *C. androgyna* Balb. Elencho, 97 (1801). TYPE: Presque Isle, Erie Co., Pennsylvania, June 9, 1869, *A. P. Garber,*[1] in herb. Olney (Brown Univ.); isotype in Gray Herb. PLATE 360, FIGS. 1–6.

Carex Garberi is the plant treated in Gray, Man. ed. 7: 232 (1908) as *C. bicolor* All., the plant which, after its first collection on Lake Superior, long stood in North America as *C. bicolor.* Agassiz got it in 1848 on the north shore of Lake Superior and it was then identified by Asa Gray as *C. bicolor* and so recorded by Agassiz.[2] Its relationship is, however, with *C. aurea* Nutt. and *C. Hassei* Bailey, with which it has, very naturally, been confused. With *C. Hassei* (FIGS 7–9) it shares the whitish papillose and dry perigynia and close spike which separate them both from *C. aurea* (FIG. 10), which has the spike loosely few-flowered and the mature perigynia fleshy, smooth, globose-pyriform and golden-orange (drying brownish). Mackenzie has been treating *C. Garberi* (*C. aurea,* var. *androgyna*) as identical with *C. Hassei* of the western United States; but, although they are both distinguished from *C. aurea* by their whitish and papillose mature perigynia and closely-flowered spikes, they differ in several important characters, indicated below.

C. HASSEI: inner summit of sheath of foliaceous bracts truncate (FIG. 9); spikes mostly remote, the terminal usually staminate throughout; scales of fertile spikes (FIG. 7) firm, ovate, mostly acuminate or prolonged into long awns, 2–4 (–6) mm. long; lowest scales of terminal spike (FIG. 8) firm, 3.5–5 mm. long, acuminate; principal staminate scales narrowed above to blunt tips, not white-margined.

[1] Abraham Pascal Garber, 1838–1881.

[2] Agassiz, Lake Superior, 166 (1850).

C. GARBERI: inner summit of sheath V-shaped (FIG. 2); spikes closely crowded and imbricated, the terminal androgynous or wholly pistillate; scales of fertile spikes (FIG. 3) membranaceous, broadly oblong or ovate to obovate, mostly rounded at summit (rarely acute) or merely short-mucronate, 1.5–2.5 mm. long; lowest scales (FIG. 4) of terminal spike membranaceous, obtuse or merely acute, 2–3.5 mm. long; principal staminate scales broadly rounded at summit, with pale scarious margin.

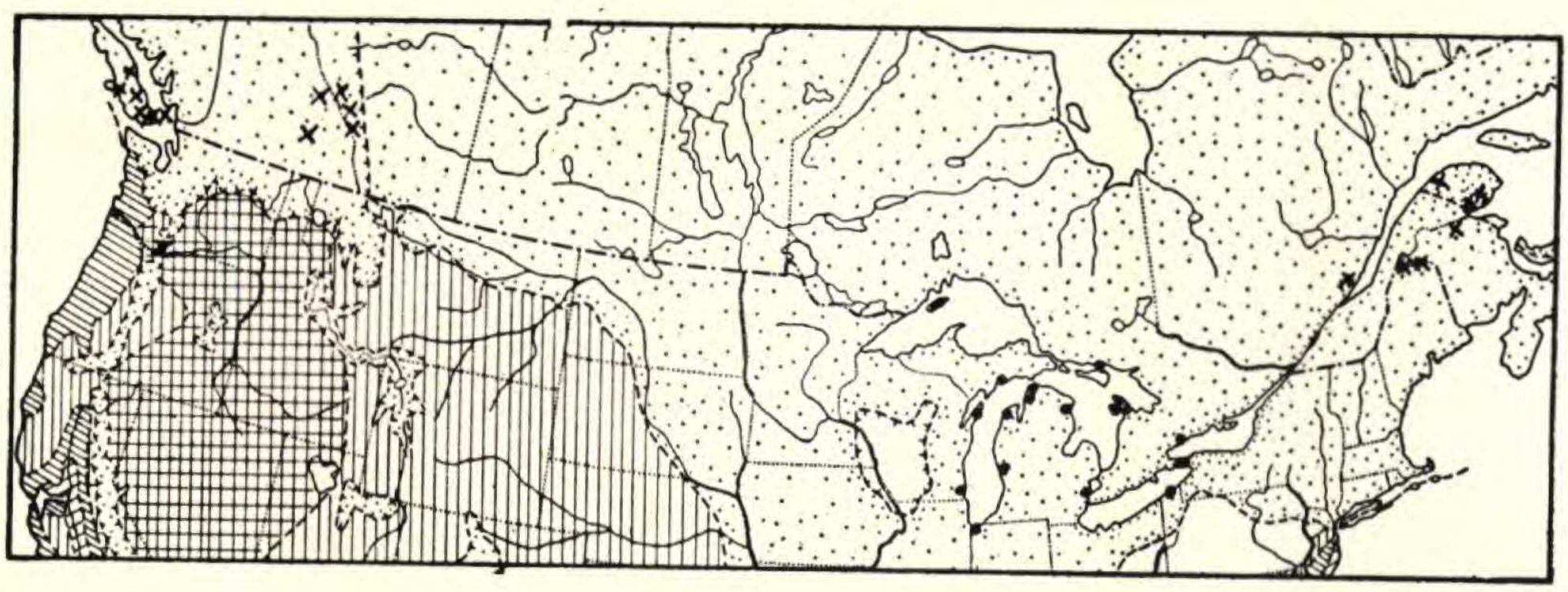
Carex Garberi (FIG. 1), abundant on beaches and rocky shores of the Great Lakes from Niagara to the head of Lake Michigan and the north shore of Lake Superior, is stiff, with strict culms 1–3 dm. high, leaves 2.5–5.5 mm. broad; fastigiate and closely approximate spikes 1–3 cm. long; scales almost colorless to medium-brown. The following specimens are in the Gray Herbarium, indicating a general occurrence on shores of the Great Lakes (MAP 13, dots).

NEW YORK: Goat Island, Niagara, June 18, 1865, *Wm. Boott.* PENNSYLVANIA: Presque Isle, Erie Co., June 9, 1869, *A. P. Garber* (TYPE in Olney Herb.—type of *C. aurea*, var. *androgyna;* isotypes in Gray Herb.); damp sand dunes, Presque Isle, *Pease*, no. 12,988. ONTARIO: shore of Hay Bay, Tobermory, Bruce Co., *P. V. Krotkov*, no. 7144; crevices in limestone, shore of Round Island, Fishing Islands, *Stebbins et al.*, no. 60; limy sand of Sauble Beach, Bruce Co., *Fernald*, no. 3180; peaty depressions in limestone pavement, Great Cloche Island, *Fernald & Pease*, no. 3181; north shore of Lake Superior, 1848, *Agassiz.* MICHIGAN: Isle Royale, *Cooper*, no. 215; calcareous gravel, bordering Bay du Noc, north of Garden, *Fernald & Pease*, no. 3184; calcareous sandy or stony beach of Lake Michigan, east of Manistique, *Fernald & Pease*, no. 8183; wet gravelly shore of Lake Michigan, Mackinaw City, *Gleason & Gleason*, no. 60; sandy banks of creeks, Big Stone Bay, Emmet Co., *Ehlers*, nos. 309, 505; shore of Thunder Bay, Alpena Co., July 15, 1895, *C. F. Wheeler;* Highland Park, Detroit, 1895, *Wheeler*; swale in jack pine plains near Lake Michigan, Glen Haven, Leelanau Co., *F. J. Hermann*, no. 2309; sand dunes near Muskegon, June 28, 1900, *C. F. Wheeler.* WISCONSIN: Point of North Bay, Door Co., June 29, 1873, *Schuette;* damp sand, Sand Beach near Rowley's Bay, Door Co., *Pease*, no. 18,007; Racine, June 19, 1881, *J. J. Davis.* INDIANA: wet sands, Pine, June 7, 1884, *E. J. Hill*, no. 35; sandy open woods, Pine, *Lansing*, no. 2721.

Typical, strict *Carex Garberi* (FIG. 1) of the Great Lakes region has a smaller representative (FIGS. 11 and 12) in the Northeast and in the Northwest. This plant is weak and flexuous, with leaves narrow, spikes fewer-flowered, short (0.5–2 cm. long) and more spreading on arching peduncles and less approximate, castaneous scales, and perigynia (FIG. 12) often with longer stipes and more papillose. It occurs along the rivers and shores from Gaspé Co., Quebec to northern New England and, still farther to the west of the Great Lakes, in the

Canadian Rocky Mountains. On account of this geographic segregation of its areas the plant may be called

C. GARBERI, var. **bifaria**, var. nov. (TAB. 360, FIGS. 11 et 12), a var. typico simillima a qua differt habitu laxiori, culmis gracillimis flexuosis ad 4.5 dm. alto; foliis 1–2.5 mm. latis; spicis vix confertis plus minusve subdistantibus, 0.5–2 cm. longis; squamis castaneis (rare pallidis); perigyniis plerumque longe stipitatis valde papillosis.—Calcareous gravelly, sandy or ledgy shores, Gaspé Co. to Quebec Co., Quebec and the St. John River, New Brunswick and Maine; southern Alberta and southern British Columbia. TYPE: wet limestone ledges by River Ste. Anne des Monts, Quebec, August 3–17, 1905, *Collins & Fernald* in Gray Herb. (MAP 13, *x*'s).



MAP 13. Range of CAREX GARBERI (dots) and of var. BIFARIA (*x*'s).

Most of the specimens have been distributed either as *Carex bicolor* All. or as *C. Hassei* Bailey; a few of them as *C. aurea* Nutt. In mature fruit there is no difficulty in distinguishing *C. Garberi* and its var. *bifaria* from *C. aurea*. When immature they are difficult to tell with certainty. The foliaceous bracts of *C. aurea* are usually more prolonged, the spikes (FIG. 10) less crowded or even remote and more peduncled, the flowers or fruits comparatively few and less densely overlapping, the scales longer and more often acuminate; and when the perigynia have dropped the denuded axis of the spike in *C. aurea* has the scars or joints more remote than in *C. Garberi* (FIG. 5).

C. SCIRPOIDEA Michx., var. CONVOLUTA Kükenthal in Engler, Pflanzenr. iv[20]. 81 (1909). Originally cited only from Thunder Bay Island, Michigan. The following are in the Gray Herbarium, showing a broad range on calcareous shores of Lake Huron. ONTARIO: Little Eagle Harbor, *J. Macoun*, no. 33,729; Bruce Co., 1871, *J. Macoum;* limestone pavement and gravel, Great Cloche Island, no. 3188. MICHIGAN: Drummond's Island, *Winchell;* Point Detour, June 30, 1860, *Wm. Boott;* Thunder Bay Island, July 18, 1895, *C. F. Wheeler*.

This plant of shores of Lake Huron is strongly pronounced in its convolute to almost filiform leaves.

C. CONCINNA R. Br. ONTARIO: dry arbor vitae woods on limestone pavement, Great Cloche Island, Manitoulin District, no. 3201; Cove Island (off Tobermory), Bruce Co., *Krotkoff*, no. 7183 (Univ. of Toronto). WISCONSIN: sandy woods on beach, Ephraim, Door Co., *Pease*, no. 18,016.

The only Ontario station given by Macoun or represented in the National Herbarium at Ottawa is on Lake Nipigon. The Wisconsin station is slightly farther south than the Michigan station (Big Stone Bay) cited by Mrs. Ehlers (Papers Mich. Acad. Sci. iv[1]. 209).

C. RICHARDSONI R. Br. ONTARIO: turfy limestone pavement, Cloche Peninsula, no. 3202. MICHIGAN: wind-swept crests, crevices and talus of sandstone-conglomerate, West Bluff, Keweenaw Co., no. 2303.

Already recorded from the Bruce Peninsula and from stations farther east in Ontario; not previously recorded, I think, from the Upper Peninsula of Michigan.

JUNCUS VASEYI Engelm. MICHIGAN: dry sandy plain near Driggs, Schoolcraft Co., no. 3223.

Apparently the first record for the Upper Peninsula.

ZIGADENUS GLAUCUS and Z. ELEGANS (PLATE 361).—In the current manuals the plant of the St. Lawrence basin, from Minnesota eastward to the limestones, shales and slates bordering the Gulf of St. Lawrence, is treated as *Zigadenus chloranthus* Richardson or, by those who do not like genera of many species, as *Anticlea chlorantha* (Richardson) Rydb., while *Z. elegans* Pursh or *A. elegans* (Pursh) Rydb. is, correctly, treated as a more western species. The characters used to separate the two plants as given by Rydberg (Fl. Prair. and Plains) are

Petals and sepals white or straw-colored, greenish only on the midrib, not clawed ..... 1. *A. elegans.*
Petals and sepals greenish, the former more or less contracted into a broad claw ..... 2. *A. chlorantha.*

If these were the only differences the two would surely not be specifically separable, especially since the "white or straw-colored" sepals and petals become in Rydberg's fuller statement "dirty-white"; accordingly, with only these differences commonly stated, in the 2nd edition of the Illustrated Flora Dr. Britton united them. Having known the eastern plant both in the field and in the herbarium since I first collected it in 1902, I have noted several characters in addition